

REVISION OF THE AUSTRALIAN VITACEAE, 2. *CAYRATIA* JUSS.

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Summary

The genus *Cayratia* Juss. is reviewed for Australian species. Two species *C. maritima* and *C. cardiophylla* are described as new. A description of the genus and of each of the eight species occurring in Australia is given, together with a key to the species.

CAYRATIA

Cayratia Juss. Dict. Sci. Nat. 10: 103 (1818), nom. cons., Dict. Class. Hist. Nat. 4: 346 (1823); Gagnepain, Notul. Syst. 1: 346 (1911).

Columella Loureiro, Fl. Cochinch. 85 (1790); Merrill, Enum. Philip. Plants 3 (1923), nom. rej.

Cissus sect. *Cayratia* (Juss.) Planchon in A. & C. DC. Monogr. Phan. 5: 47 (1887).

Type: *Cayratia pedata* (Loureiro) Jussieu ex Gagnepain.

Climbing or scrambling vines, slender, evergreen or deciduous, underground system sometimes tuberous. Tendrils leaf-opposed, often branched several times, each branch subtended by a bract. Leaves alternate, compound, 3-5-foliolate, pinnate or pedate, margins usually serrated. Stipules 2, caducous. Degree and type of pubescence on aerial parts varies between species. Inflorescence axillary, pseudoaxillary or leaf-opposed, pedunculate, carried above the leaves, multiflowered in irregular corymbose cymes, often loose; peduncles and pedicels subtended by bracts. Flowers bisexual, small, tetramerous, pedicellate, buds often swollen. Calyx cup-shaped or margins sometimes spreading. Corolla with 4 free lobes, cohering in bud by the interlocked epidermal cells, sometimes cucullate at the apex, reflexed after anthesis. Stamens inserted on the receptacle at the base of the disc, opposite the petals, filaments erect, often flattened, anthers introrse, dorsifixed opening by longitudinal slits. Pollen grains tricolporate. Disc adnate to and entirely surrounding the ovary, the 4 rounded lobes sometimes extending above the ovary. Ovary 2-locular with 2 anatropous, basally attached ovules per locule; style conical, stigma minute, expanding after anthesis. Berry fleshy with 1-4 triangular to ovoid seeds. Shape of seeds in transverse section varies according to the number maturing in the fruit, the flattened area on the dorsal surface formed by the perichalaza may be rounded or elongate, 1 or 2 furrows or pits are present on the ventral surface. Endotesta lignified sometimes with lateral flanges, endosperm ruminations in transverse section may be T-shaped or U-shaped. Mucilage cells and raphide sacs also often with mucilage, appear to be present in all organs.

Cayratia may be distinguished from the closely related genus *Cissus* by the following characters: leaves compound, petiolules associated with the leaflets, ratio central petiolule to lateral petiolule rarely less than 2; inflorescence a dichotomous cyme, usually axillary or pseudoaxillary by the abortion of the lateral axis; endosperm in transverse section either T-shaped or U-shaped. Two of the characters by which Gagnepain (1911) and Latiff (1981) separated these two genera are not valid for Australian species. They considered that in *Cissus* the leaves are always simple and the berry is 1-seeded. Although leaf size, margin indentation and degree of pubescence exhibit considerable intraspecific variation, number of leaflets, shape and relative size, position of hairs, nature of the tendrils and seed characteristics are useful diagnostic characters. All measurements and observations in this paper refer to dried mature organs unless otherwise indicated.

According to Galet (1967) there are about 63 species most of which occur in the tropical and subtropical areas of Africa, Asia, Australia and many of the Pacific Islands.

Eight species occur in Australia, three are endemic, and two are endemic to Australia and adjacent areas of New Guinea. The species in Australia fall into three separate groups distinguished by leaf, fruit and seed characters.

Key to the Species

1. Leaflets 3 2
 Leaflets 5 6
2. Mature fruit purple to black drying black 3
 Mature fruit pale drying brown 4
3. Tendrils 3-fid, hooked hairs restricted to midrib on adaxial surface . . 1. *C. maritima*
 Tendrils 4–5-fid, adhesive disc present on branch tips, hairs not restricted 2. *C. trifolia*
4. Abaxial surface of mature leaf glabrous 3. *C. saponaria*
 Abaxial surface of mature leaf pubescent 5
5. Flowering occurs on young shoots. Length/breadth ratio of central leaflet
 0.96 ± 0.12 4. *C. cardiophylla*
 Flowering occurs on branches with fully expanded leaves. Length/breadth
 ratio of central leaflet 1.47 ± 0.4 5. *C. acris*
6. Base of central leaflet oblique. Filaments broad. Length/breadth ratio *ca*
 3:2 6. *C. eury nema*
 Base of central leaflet rounded or cuneate. Filaments narrow. Length/breadth
 ratio *ca* 4:1 7
7. Inflorescence axillary. Apex of corolla cucullate. Base of central leaflet
 rounded. Stipules usually less than 4 mm 7. *C. japonica*
 Inflorescence leaf-opposed, or pseudoaxillary. Apex of corolla not cucullate.
 Base of central leaflet usually cuneate. Stipules longer than
 4 mm 8. *C. clematidea*

1. *Cayratia maritima* B.R.Jackes, *sp. nov.* affinis *C. trifoliae* (L.) Domin foliis maturitate glabris praeter paginam adaxialem qua costa compressa verticaliter pilos multicellulares uniseriatis feret, cirrhis 3-fidis sine discis adhaerentis ad apices distinguitur. **Typus:** Lakefield, 15°07'S, 144°17'E, 26 Jun 1982, B.R.Jackes 'growing over shrub beside billabong. Alluvial. Luxuriant vine, fruits black, flowers greenish' (holo: BRI; iso: A,CANB,DNA,K,L,MEL, NSW).

Vitis carnos Wall. Cat. 6018 (K).

Frutex ramis angularis plerumque glabris pilis simplicibus ad nodos praeditis, raro deciduus, si ita per intervallum breve non nisi in meridionale limitate. Tuber quum adest breve. Capreoli 3 fidi glabri. Folia trifoliolata; foliolum medium ovatum usque rhomboideum, apice acuminate, 7.2 cm × 3.8 cm; foliola lateralia obliqua interdum loba 5.1 cm × 3.3 cm, marginibus crenulato-serratis, pagina supra glabra maturitate praeter costam verticaliter compressam pilos simplices uniseriatis 3–4 cellulares uncinatos ferentem, pagina inferne plerumque glabra, aliquando pilis uncinatis in venis prope junctionem petioli laminaeque; petiolulus medius supra porcatus, plerumque pilis uncinatis (1–)1.5(–4) cm longis; petioluli laterales (0.2–)0.5(–1.2) cm longi; petiolus (2–)3.5(–6.8) cm longus. Stipulae triangulares 1.5–2 mm longae. Inflorescentia supra folia portata cymosa corymbiformis 6.5 cm × 4 cm, pedunculo (3–)4(–8) cm longo. Calyx papillosus; corolla papillosa pallide viridis usque alba usque flavida 2 mm × 2 mm; filamenta

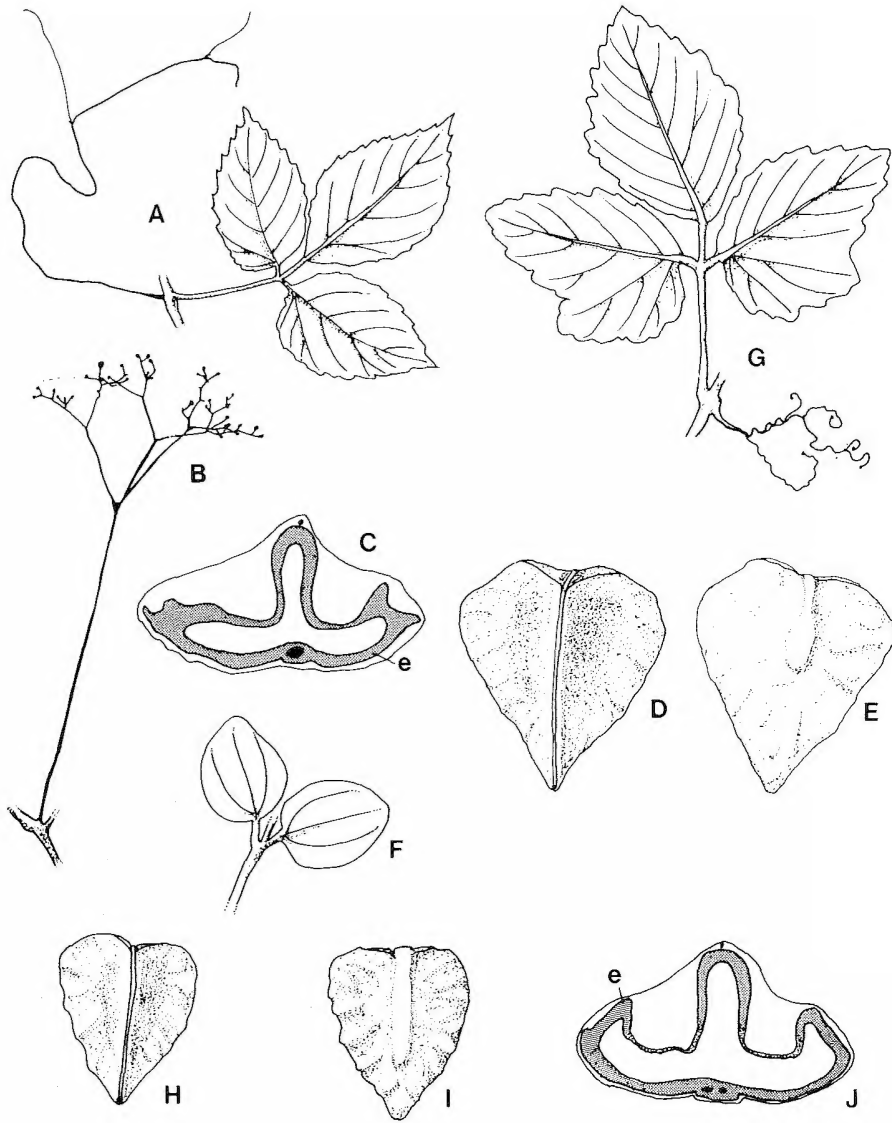


Fig. 1. *Cayratia maritima*: A. leaf and tendril with three branches $\times 0.5$. B. inflorescence $\times 0.5$. C. median transverse section of mature seed $\times 7.5$. D. seed, ventral surface showing position of the raphe $\times 5$. E. seed, dorsal surface showing the position and shape of the perichalaza $\times 5$. F. cotyledons $\times 0.5$. *C. trifolia*: G. leaf and tendril with five branches $\times 0.5$. H. seed, ventral surface showing position of the raphe $\times 5$. I. seed, dorsal surface showing position and shape of the perichalaza $\times 5$. J. median transverse section of mature seed $\times 10$ (e - lignified endotesta.).

staminalia 1–1.5 mm longa; antherae 0.5 mm longae. Bacca nigra, depresso-globula, 1.2–1.5 cm × 0.6–1 cm, 2–4 seminibus naviculiformis 5.5–7 mm × 5–7 mm, a ventre sulcus duobus vadosis notatis; endospermium T-forme in sectione transversali.

Scrambling vine, stems angular, usually glabrous, simple hairs at nodes when young. Tendrils 3-fid, glabrous. Plant rarely deciduous, if so, for a short period only on the southern limits. Tuber if present, small. Leaves trifoliolate. Central leaflet ovate to rhomboid, apex acuminate (3–)7.2(–10.5) cm × (2.2–)3.8(–6) cm; lateral leaflets oblique, sometimes lobed (2.5–)5.1(–7.6) cm × (1.9–)3.3(–4.3) cm. Margins crenulate-serrate. Upper surface glabrous at maturity except for the vertically compressed midrib which bears uniseriate 3–14-celled hooked hairs. Lower surface usually glabrous, occasionally hooked hairs are present on veins near the junction of the petiole and lamina. Central petiolule ridged on top, hooked hairs usually present, (1–)1.5(–4) cm long; lateral petiolule (0.2–)0.5(–1.2) cm long. Petiole (2–)3.5(–6.8) cm long. Stipules triangular 1.5–2 mm long. Inflorescence axillary, 3–5 primary branches, cymose, corymbiform (5–)6.5(–15) cm × (3.5–)4(–10) cm, peduncle (3–)4(–8) cm long. Calyx papillose. Corolla papillose, pale green to white to yellowish, 2 mm × 2 mm. Filaments 1–1.5 mm long, anthers 0.5 mm long. Berry black, depressed-globular, 1.2–1.5 cm × 0.6–1 cm. Seeds 2–4 per fruit, boat-shaped, 5.5–7 mm × 5–7 mm; 2 shallow grooves on the ventral surface, endosperm in transverse section T-shaped. **Figs. 1A–F, 2A.**

Representative Specimens Examined. Northern Territory. South of Bushman's Camp and north of Channel Point, mouth of Daly River, 13°15'S, 129°58'E, May 1978, *Webb & Tracey* 12230 (BRI,CANB); Mardlow, Melville Island, Apr 1967, *Stocker & Fox* (BRI,QRS); Near Cahill's Crossing, East Alligator River, 12°30'S, 133°00'E, May 1978, *Webb & Tracey* 12231 (BRI,CANB). Queensland. COOK DISTRICT: Saibai, Jul 1975, *Stocker* 1365 (QRS); Kerr Point, Weipa, Jun 1982, *Jacks* (BRI,CBG,PERTH,QRS); Normanby River, Aug 1979, *Done* (BRI); Cairns Central Swamp, Feb 1979, *Wright* (BRI,K,L,NSW).

Specimens from 38 Australian localities were examined.

Distribution and Habitat: This vine is commonly found growing along tropical coastlines (**Map 1.**) and adjacent areas which are seasonally inundated as well as around lagoons and along creek banks. It extends into Indonesia, New Guinea and neighbouring Pacific Islands. Soils are usually alluvial or sandy.

Flowering period: spring to summer.

Fruiting period: summer to winter.

Notes and Observations: This species is readily distinguished from the related *C. trifolia* by the 3-fid tendrils which lack adhesive pads at the apices and by the mature leaves which are glabrous except for hooked hairs on the adaxial midrib. Leaves usually dry dark grey.

2. *Cayratia trifolia* (L.) Domin, Biblioth. Bot. 89: 370 (1927).

Vitis trifolia L., Spec. Pl. 203 (1753); Benth., Fl. Austral. 1: 449 (1863); F.Muell., Fragm. 6: 177 (1868), 9: 126 (1875); F.M.Bailey, Qd Fl. 1: 281 (1899).

Cissus trifolia (L.) K.Schum. in Schum. et Hollr., Fl. Kaiser Wilh. Land 71 (1889); Warburg, Bot. Jahrb. Syst. 13: 369 (1891).

Columella trifolia (L.) Merrill, Philipp. J. Sci. 11: 132 (1916).

Cissus acutifolia Poir., Encycl. Suppl. 1: 106 (1810); DC. Prodr. 1: 630 (1824).

Cissus carnosa Lamk. Encycl. 1: 31 (1783); Planchon in A. & C.DC., Monogr. Phan. 5: 570 (1887); DC., Prodr. 1: 630 (1824); Roxb., Fl. Ind. 1: 427 (1820).

Cissus cinerea Lamk., Tabl. Encycl. 1: 332 (1791); DC., Prodr. 1: 631 (1824). **Type:** Lamk. (P).

Cissus crenata Vahl, Symb. Bot. 3: 19 (1794); Wall. Cat. 6021 (K) (1831–32).

Cissus obtusifolia Poir., Encycl. Suppl. 1: 106 (1810); Lamk., Encycl. 1: 31 (1783). **Type:** Herb. Lamk. (P).

Vitis psoralifolia F.Muell., Fragm. 2: 75 (1860). **Type:** Victoria River (K,GH,MEL).

Cissus psoralifolia (F.Muell.) Planchon in A. & C.DC. Monogr. Phan. 5: 567 (1887), based on *V. psoralifolia*.

Cayratia carnosa (Lamk.) Gagnep. in Lecomte, Notul. Syst. (Paris) 1: 347 (1911), based on *Cissus carnosa* Lamk.

Weak climber, frequently clinging to trees, stems angular, pubescent when young, hairs uniseriate 4-16-celled. Tendrils 4-5-fid, branches ending in adhesive discs, initially pubescent becoming glabrous with age. Plants usually deciduous, tubers present. Leaves trifoliolate often somewhat fleshy. Central leaflet ovate to rhomboid, apex acuminate (2.3-5.2(-11) cm × (1.3-3.3(-7.2) cm; lateral leaflets oblique, often lobed (1.8-4(-9) cm × (1.1-2.8(-5.8) cm. Margins crenulate to dentate. Upper surface pubescent often becoming glabrous with age, or hairs become restricted to the main veins, lower surface pubescent, often sparsely so when old; hairs on both surfaces curved, uniseriate 2-7-celled. Central petiolule ridged, pubescent (0.3-1.1(-3) cm long; lateral petiolule (0.1-0.3(-0.8) cm long. Petiole (1.2-3.9(-7.7) cm long. Stipules triangular (2-3(-4) mm long. Inflorescence axillary, 3-4 primary branches, cymose corymbiform (4-7(-12) cm × (2-4(-8) cm; peduncle (2-4(-6.5) cm long, all parts shortly pubescent. Calyx papillose. Corolla papillose, 1.5-2 mm × 1-1.5 mm, pale green to yellowish. Filaments 1 mm long, anthers 0.5 mm long. Berry purple-black, depressed-globular 0.8-1.7 cm × 0.6-0.8 cm. Seeds 2-4 per fruit, boat-shaped, 4-6 mm × 4-4.5 mm; 2 shallow grooves on the ventral surface, endosperm in transverse section T-shaped. **Figs. 1G-J, 2B.**

Representative Specimens Examined. Western Australia. Crater Valley, 38 km NNW of Wyndham, Mar 1978, *Lazarides* 8555 (CANB,K,NT); Ord River, 2 miles [3.2 km] below Carlton Reach, May 1944, *Gardner* 7285 (PERTH). Northern Territory. Banjo Beach, Melville Island, Jan 1966, *Stocker* (BRI,NT); Gove Airport area, Feb 1977, *Hinz* 7724 (NT); Cannon Hill airstrip, Feb 1973, *Martensz* (BRI,CANB,DNA,K,L,NSW,NT); Victoria River, *Mueller* (MEL); Rapid Creek, Katherine, Jan 1943, *Hely* (CANB); 60 km W of Dunmarra, Jul 1978, *Jackes* (CANB,JCT,NSW). Queensland. COOK DISTRICT: Halfway Island, 11°23'S, 142°58'E, Feb 1979 *Duke* (JCT); 12.5 km NNE of Weipa Mission, Dec 1974, *Specht & Salt* (BRI); Base of Black Mountain, SW of Cooktown, Dec 1965, *Rodd* 219 (NSW). BURKE DISTRICT: Near Doomagee Mission on Burketown Road, Jun 1978, *Jackes* (JCT). NORTH KENNEDY DISTRICT: 45 miles [72 km] SE Mount Garnet, Jan 1968, *Morain* 279 (BRI); Collinsville-Bowen Road, Jan 1978, *Jackes* (JCT).

Specimens from 131 Australian localities were examined.

Distribution and Habitat: This species extends from India to the Pacific. In Australia it is found (**Map 2.**) chiefly in open forest in tropical regions usually climbing on trees with persistent bark. Soils are variable.

Flowering period: spring to summer.

Fruiting period: summer to autumn.

Notes and Observations: Leaf size, thickness, nature of the leaf margin and degree of pubescence are highly variable in this species. Hairs are always present on both leaf surfaces when young. Size of leaf appears to be related to habitat, those plants growing in moister, protected areas usually have the largest leaves.

3. *Cayratia saponaria* (Seem. ex Benth.) Domin in Fedde, Repert. 11: 294 (1912).

Vitis saponaria Seem. ex Benth., Fl. Austral. 1: 448 (1863). **Lectotype** (designated here): Voyage of Rattlesnake, Piper's Islets, 27 Sep 1848, *McGillivray*; **lectopara:** Torres Strait, *Brown* (E,K); Cape York, *McGillivray* (K); F.Muell., *Fragm.* 6: 178 (1868); F.M.Bailey, *Qd Fl.* 1: 280 (1899).

Cissus saponaria (Seem.) Planchon in A. & C.DC., *Monogr. Phan.* 5: 574 (1887).

Vitis strigosa F.M.Bailey, *Qd Fl.* 1: 281 (1899). **Type:** Ranges about Cairns, *Nugent* 124 (BRI).

Cayratia strigosa (F.M.Bailey) Domin in Fedde, Repert. 11: 264 (1912).

Cissus bicolor Domin, *Biblioth. Bot.* 89: 921 (1927). **Type:** Harvey's Creek, 1910, *Domin* 6373, 6374 (PR).

Robust vine, stems rounded, glabrous or with minute papillae. Tendrils bifid, papillae may be present. Leaves trifoliolate. Central leaflet ovate to broadly ovate, apex acuminate-caudate, base weakly cordate, (12-13.9(-17.5) cm × (6.2-10.2(-13) cm; lateral leaflets oblique (10.5-13.3(-16) cm × (7.2-9.6(-12.5) cm. Margins with numerous shallow serrations on both sides. Upper surface glabrous at maturity, glossy, some small hairs may be present near the base of the midrib. Lower surface usually with simple, uniseriate 5-10-celled hairs towards the base of the midrib and main laterals at maturity, hairs often dense near junction of the lamina and the petiolule. Central petiolule (1.3-3.9(-6.6) cm long; lateral petiolule (0.7-2.4(-4.5) cm long. Petiole (5-8.5(-11.2) cm long, small rusty coloured hairs may be present, often glabrous at maturity, base swollen, lenticels

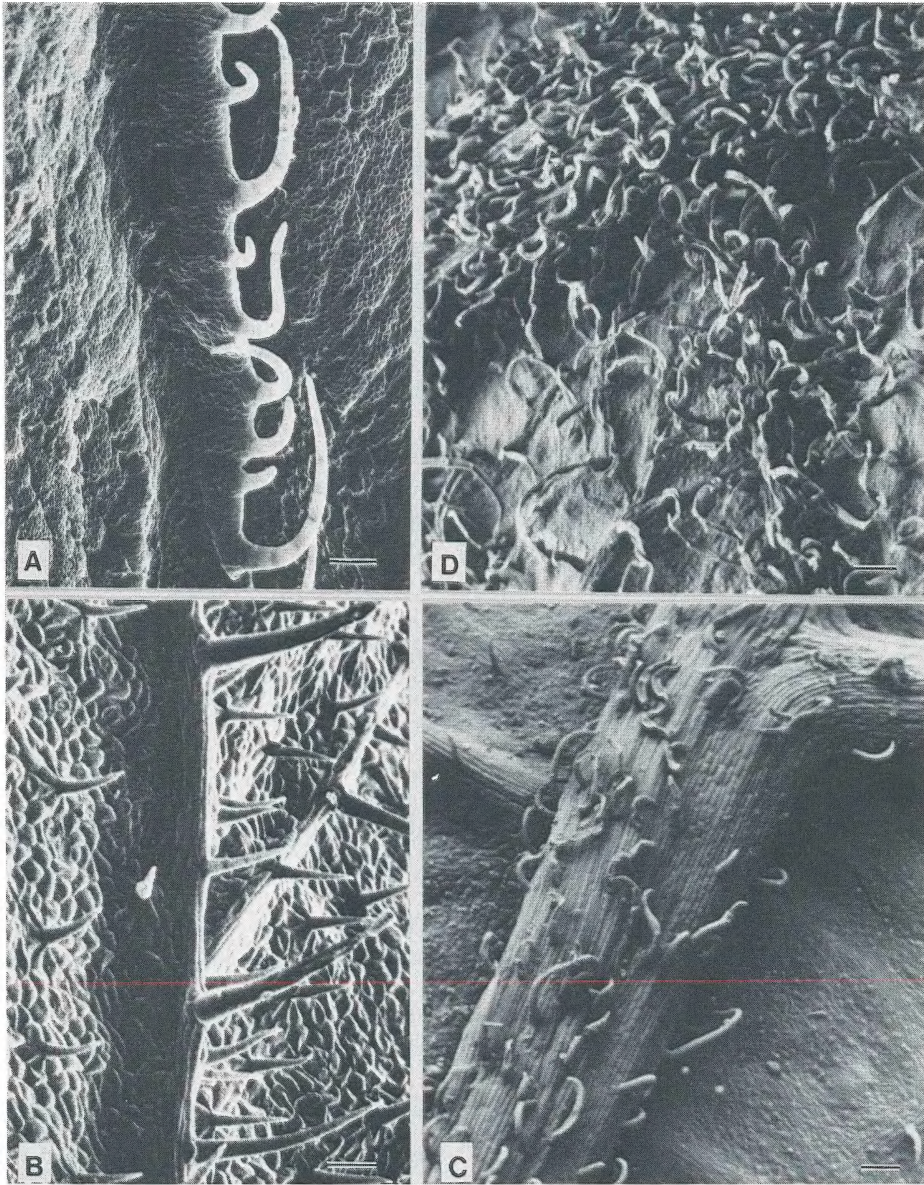


Fig. 2. A. *Cayratia maritima*, upper leaf surface showing the hooked hairs on the midrib. B. *C. trifolia*, upper leaf surface showing hairs scattered over surface of leaf as well as on the midrib. C. *C. acris*, distribution of hairs on the lower leaf surface. D. *C. cardiophylla*, distribution of hairs on the lower leaf surface. All scale bars equal 0.1 mm.

prominent. Stipules triangular 1–1.5 mm × 1 mm. Inflorescence axillary, 3–4 primary branches, cymose corymbiform 20 cm × 15 cm; peduncle 5–10 cm long. Calyx glabrous or with minute papillae. Corolla glabrous, 2–2.5 mm long, white. Filaments flattened, 1 mm long, anthers 1 mm long. Disc thick. Berry whitish at maturity drying to brown, depressed-globular, 1–1.5 cm × 1–1.2 cm. Seeds 1–4 per fruit, rounded, 5.5–7 mm × 5–7 mm, endosperm U-shaped, chalaza elongated. **Fig. 3A–D.**

Representative Specimens Examined. Queensland. COOK DISTRICT: Between Lockhart River airstrip and Mount Tozer, 12°04'S, 143°2'E, Feb 1980, *Clarkson* (BRI,JCT,K,QRS); Daintree River, on south bank about 5–6 miles [8–9.6 km] E of Daintree, Oct 1962, *Smith* 11507 (A,BRI,K,L); Mrs Kidner's Block, near Millstream River ca 10 km NNE of Ravenshoe, Apr 1979, *Lockyer* (BRI,CANB,CBG,QRS). NORTH KENNEDY DISTRICT: Near Tully River Bridge, Cardstone, 17°45'S, 145°40'E, Jan 1983, *Jackes & Jackes* (A,BISH,BRI,CANB,CBG,DNA,JCT,K,L,MEL,NSW PERTH,QRS); Kirrama State Forest, NW Cardwell, Jun 1977, *Winsor* (JCT).

Specimens from 18 localities were examined.

Distribution and Habitat: This species is found (**Map 5.**) in rainforest or rainforest remnants from north of Cardwell 18°06'S, 146°02'E, to northern Cape York Peninsula.

Flowering period: spring to summer.

Fruiting period: summer to early autumn.

Notes and Observations: The specimen selected as the lectotype is the more complete specimen of the syntypes upon which Benthams based his description. *C. saponaria* (Seem. ex Benth.) Domin and *C. seemanniana* A.C.Smith have been confused in the literature as both species were based on the name *Vitis saponaria*. However as indicated by Smith (1942) these are two different species and the latter may be distinguished by 'the persistent tufts of hairs in the axils of nerves on the lower surface'. He also considered the leaflets to be thinner and the lateral leaflets to be more cordate at the base; however these are very variable characters.

The description of *Cissus bicolor* Domin does not agree with the specimen cited as the type. The leaves of this specimen (Domin 6373, 6374, PR) and of the illustration (Domin 1927, p923) are in fact the leaflets of *Cayratia saponaria*.

4. *Cayratia cardiophylla* B.R. Jackes, sp. nov. affinis *Cayratia acris* (F.Muell.) Domin filamentis staminalibus angustis, pilis 1–3 cellularibus ad junctioneum ovarii stylique, nerncon florens ante expansionem plenam foliorum in surculis novis, raro in sylvia pluvialia inventa distinguitur. **Typus:** Annan River, upstream growing at river edge over *Hibiscus*, 10 Dec 1978, *Duke* (holo: BRI; iso: CANB,NSW,PERTH, QRS,JCT).

Liana grandis plerumque decidua ramis teretibus tomentosis juventute; cortex rubescens squamata. Capreoli bifidi pubescentes. Folia trifoliolata; foliolus medius late ovato-circularis, apice acuminato-obtusus, basi cordatus 14.6 cm × 15.2 cm; folioli laterales obliqui 12.5 cm × 13.4 cm, marginibus in lateribus ambabus costae non profunde serratis, paginis ambis dense pubescentibus juventute, superiore sparse pubescenti maturiate pilis plerumque erectis simplicibus 5–7 cellularibus in pagina superiore et plerumque densis et saepe tortis 3–12 cellularibus in pagina inferiore, venis tertiariis reticulum prominens facientibus; petiolulus medius (2.2–)3(–6) cm longus; petioluli laterales (1–)1.8(–4.5) cm longi; petiolus (7.5–)9.5(–13) cm longus, pubescens. Stipulae triangulares 1.5–2 mm longae pubescentes. Inflorescentia in surculo novo magnopere ultra folia juvenia expandentia, 2–3 ramis primariis, cymosa corymbiformis 9.5 cm × 9 cm, pedunculo 4–5 cm longo. Calyx cyathiformis margo membranaceo patulo, papillosus; corolla pallide viridis usque albescens extra papillosa, 2–2.5 mm longa; filamenta staminalia 1 mm longa, tantum parum complanata; antherae 0.6–0.75 mm longae; ovarium disco crasso circumcinctum labro parvo vel nullo, 1–3 cellularibus papillis ad junctionem ovarii et basis styli praeditum. Bacca viriditer alba usque alba, brunnea in sicco, depresso-globula 1–1.3 cm × 0.4–0.7 cm, 2–4 globatis seminibus continuens, endospermio U-formi in sectione transversali, praedito projectura media sed tum ea nunquam quam projecturae laterales longior.

Large sprawling vine with rounded stems, whitish tomentose when young, bark flakey, reddish. Tendrils bifid, pubescent. Plant usually deciduous. Leaves trifoliolate. Central leaflet broadly ovate-circular, apex acuminate-obtuse, base cordate (13–)14.6(–18) cm × (12–)15.2(–18.5) cm; lateral leaflets oblique (10.2–)12.5(–15) cm × (9.4–)13.4(–16.5) cm.

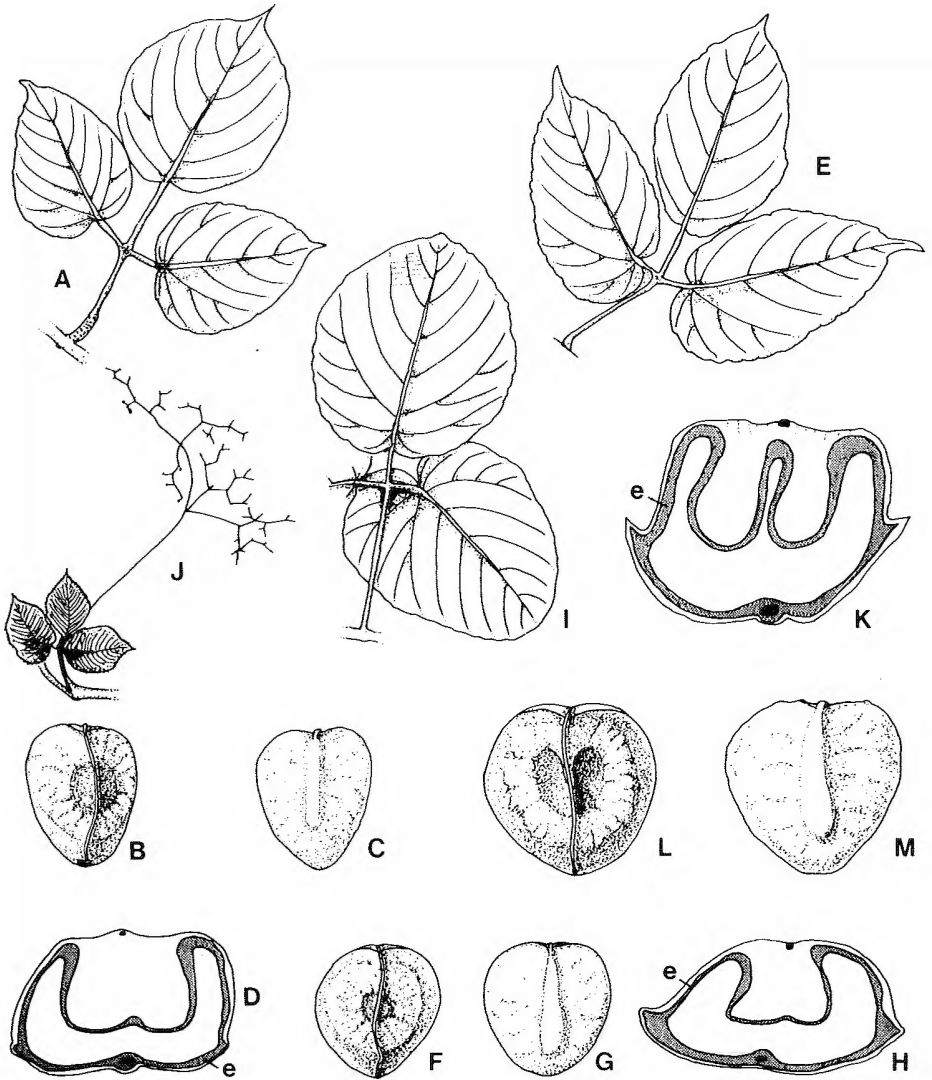


Fig. 3. *Cayratia saponaria*: A. leaf $\times 0.25$. B. seed, ventral surface showing position of the raphe and circular ridge formed by the underlying endotesta $\times 5$. C. seed, dorsal surface showing the position and shape of the perichalaza $\times 5$. D. median transverse section of mature seed $\times 10$. *C. acris*: E. leaf $\times 0.25$. F. seed, ventral surface showing position of the raphe and the circular ridge formed by the underlying endotesta $\times 5$. G. seed, dorsal surface showing the position and shape of the perichalaza $\times 5$. H. median transverse section of mature seed $\times 10$. *C. cardiophylla*: I. portion of trifoliolate leaf $\times 0.25$. J. inflorescence at anthesis showing very young leaves at base of peduncle $\times 0.5$. K. median transverse section of mature seed $\times 7.5$. L. seed, ventral surface showing position of the raphe and the circular ridge formed by the underlying endotesta $\times 5$. M. seed, dorsal surface showing the position and shape of the perichalaza $\times 5$. (e - lignified endotesta).

Margins with shallow serrations on both sides of the midrib. Both leaf surfaces densely pubescent when young, upper sparsely pubescent when mature, hairs usually erect, uniseriate 5–7-celled on the upper surface, on the lower surface hairs are 3–12-celled and usually dense and often twisted. Tertiary veins form a prominent network. Central petiolule (2.2–)3.8(–6) cm long; lateral petiolules (1–)1.8(–4.5) cm long. Petiole (7.5–)9.5(–13) cm long, pubescent. Stipules triangular 1.5–2 mm long, pubescent. Inflorescence axillary, borne on new growth and carried well beyond young expanding leaves, 2–3 primary branches, cymose corymbiform, (8–)9.5(–11) cm × (6–)9(–10) cm, peduncle 4–5 cm long. Calyx cupshaped with flaring membranous margin, papillose. Corolla papillose, pale green to whitish, 2–2.5 mm long. Filaments 1 mm long, only slightly flattened, anthers 0.6–0.75 mm long. Ovary surrounded by a thick disc, rim small or absent, 1–3-celled papillae present at the junction of the ovary and the base of the style. Berry greenish-white to white, drying brown, depressed-globular, 1–1.3 cm × 0.4–0.7 cm. Seeds 2–4 per fruit, rounded, 4–4.5 mm × 3–4 mm, endosperm in transverse section a modified U-shape, although the central projection is present, it is never longer than the lateral projections. **Figs. 2D, 3I–M.**

Representative Specimens Examined. Queensland. COOK DISTRICT: Sue Island, 10°12'S, 142°49'E, Oct 1981, *Clarkson* 3951 (BRI, QRS); Between Lockerbie and Somerset, 10°46'S, 142°33'E, Dec 1980, *Hyland* 10966 (QRS); Low Wooded Island, 15°05'S, 145°23'E, Sep 1973, *Stoddard* (BRI); Base of Black Mountain, SW of Cooktown, Dec 1965, *Rodd* 213 (NSW); Limestone outcrop 4 miles [6.4 km] N of Mungana, approx 17°05'S, 144°25'E, May 1970, *Webb & Tracey* (BRI).

Specimens from 39 localities were examined.

Distribution and Habitat: This vine, which is usually deciduous, is commonly found growing over beach rubble, along river edges and in semi-deciduous vine thickets, rarely in rainforest. It appears to prefer limestone based soils and coral rubble. It is found in North Queensland and the Torres Strait (**Map 3.**) chiefly on coral islands and around Chillagoe.

Flowering period: August to December.

Fruiting period: November to May.

Notes and Observations: Several sterile senescing specimens from Western Australia and Northern Territory have been provisionally placed in this species on the basis of leaf pubescence and shape, however further collections preferably obtained before the onset of the dry season are required for clarification. This species which is closely related to *C. acris* may be distinguished by a number of characters: the length/breadth ratio of the central leaflet is 0.96 ± 0.12 , compared with that for *C. acris* (1.47 ± 0.4); the filaments are much narrower; 1–3-celled hairs are present at the junction of the style and the top of the ovary, as well flowering occurs on new growth before the leaves have fully expanded. This species also appears to flower more frequently if the number of flowering specimens in collections is any indication. However sterile senescing specimens cannot be assigned absolutely to either species.

This species has been previously misidentified as *C. grandifolia*, however the type specimen of this species is less pubescent, although flowers in reasonable condition were unavailable, the leaves on the specimens were fully expanded.

5. *Cayratia acris* (F.Muell.) Domin in Fedde, Repert. 11: 294 (1912). **Syntypes:** Richmond R., *Beckler* (MEL,K); Burnett and Pine Rivers, *Mueller* (MEL,K).

Vitis acris F.Muell., *Fragm.* 11: 75 (1860); Benth., *Fl. Austral.* 1: 449 (1863); F.M.Bailey, *Qd Fl.* 1: 281 (1899); C. Moore, *Handb. Fl. N.S.W.*, 213 (1893).

Cissus acris (F.Muell.) Planchon in A. & C.DC., *Monogr. Phan.* 5: 576 (1887).

Cissus grandifolia Warburg, *Bot. Jahrb. Syst.* 18: 199 (1894). Type: Kelana, 6 Aug 1888, *Hellwig* 125 (K).

Cayratia grandifolia (Warb.) Merrill and Perry, *J. Arnold Arbor.* 22: 378 (1941).

Robust vine with rounded stems bearing uniseriate, spreading 4–15-celled hairs resulting in a whitish appearance when young. Tendrils bifid, usually pubescent. Plants occasionally deciduous. Leaves trifoliolate. Central leaflet usually broadly lanceolate to ovate, apex acuminate to cuspidate, base rarely strongly cordate, (12.6–)16.2(–23.5) cm × (7–)11.3(–18.2) cm; lateral leaflets oblique (10.5–)14.6(–21.5) cm × (6.6–)10.4(–17) cm. Margins with

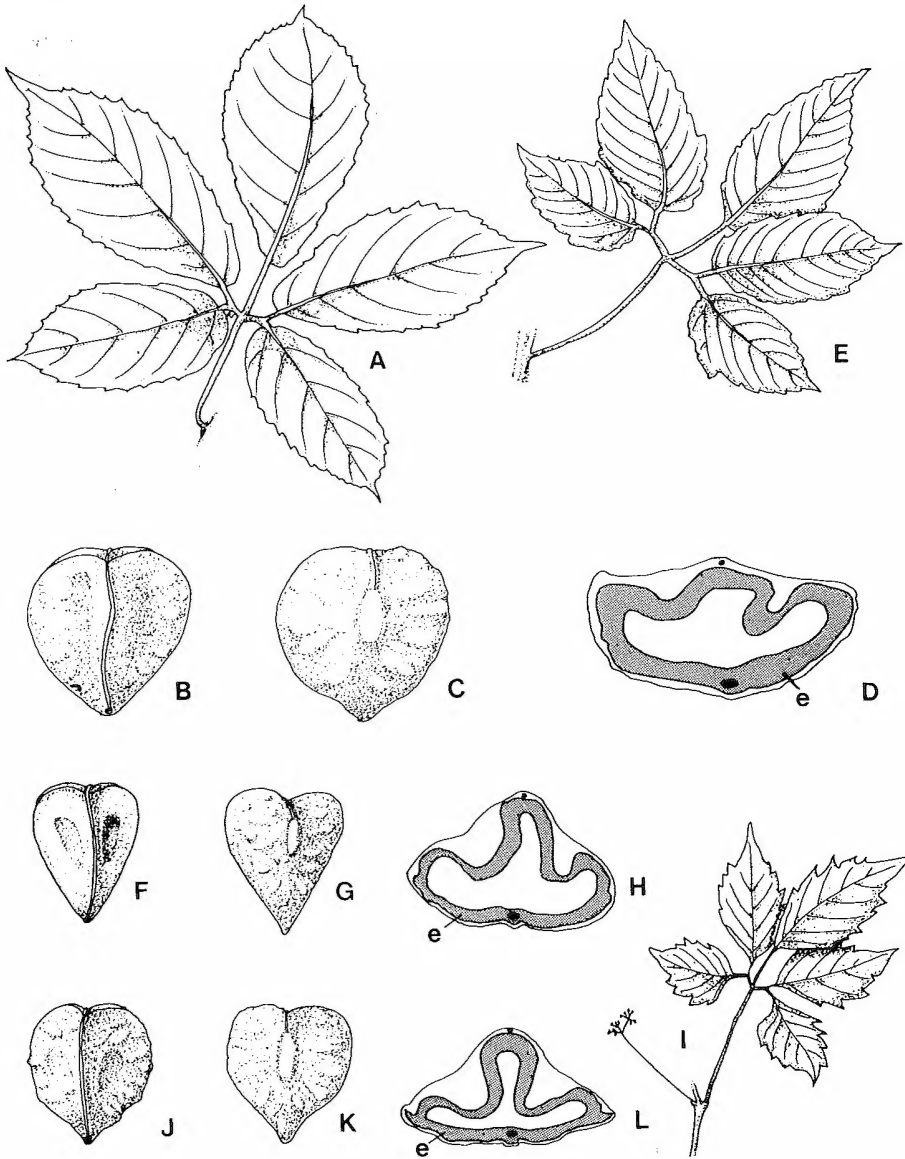


Fig. 4. *Cayratia eurynema*: A. leaf $\times 0.5$. B. seed, ventral surface showing the position of the raphe $\times 5$. C. seed, dorsal surface showing the shape and position of the perichalaza $\times 5$. D. median transverse section of mature seed $\times 7.5$. *C. japonica*: E. leaf $\times 0.5$. F. seed, ventral surface showing position of the raphe $\times 5$. G. seed, dorsal surface showing the position and shape of the perichalaza $\times 5$. H. median transverse section of mature seed $\times 5$. *C. clematidea*: I. leaf and leaf-opposed inflorescence $\times 0.5$. J. seed, ventral surface showing the position of the raphe $\times 5$. K. seed, dorsal surface showing the position and shape of the perichalaza $\times 5$. L. median transverse section of mature seed $\times 10$. (e - lignified endotesta).

numerous shallow serrations on each side of the midrib. Upper surface with uniseriate 4–10-celled hairs, at maturity these are usually associated with the raised veins, sparse elsewhere, lower surface usually densely pubescent, both costally and intercostally, hairs 4–10-celled, straight to curved. Central petiolule (2–)4.1(–5.9) cm long; lateral petiolules (0.7–)1.7(–3.5) cm long. Petiole (4.6–)8.3(–17.8) cm long, small hairs usually associated with the slightly swollen base, lenticels inconspicuous. Stipules triangular, glabrous, 1 mm long. Inflorescence axillary with 2–3 primary branches, cymose corymbiform, ca 25 cm × 20 cm; peduncle ca 10 cm long. Calyx spreading. Corolla often papillose, 1.5–2 mm × 1.5 mm, pale green to yellowish. Filaments 0.75 mm long, flattened, anthers 0.75 mm long. Disc thick, membranous rim extending well above the ovary. Berry creamy-white, drying brown, ovoid, 1 cm diameter. Seeds 1–4 per fruit, rounded, 5–6 mm × 4–5 mm, endosperm in transverse section U-shaped. Figs. 2C, 3E–H.

Representative Specimens Examined. Northern Territory. South of Bushman's Camp and north of Channel Point, north of Daly River, 13°15'S, 129°58'E, May 1978, *Webb & Tracey* 12215 (BRI,CANB). Queensland. COOK DISTRICT: Thursday Island, Feb 1984, *Garnett* (BRI,JCT); McIlwraith Range ca 14 miles [22.4 km] ENE of Coen, Oct 1962, *Smith* 11852 (BRI). NORTH KENNEDY DISTRICT: Cardstone, W of Tully, Jul 1979, *Jacks* (JCT). PORT CURTIS DISTRICT: Mount Etna via Rockhampton, May 1971, *Webb & Tracey* 10724 (BRI); Rosedale near Baffle Creek, Apr 1920, *White* (BRI). DARLING DOWNS DISTRICT: Cawdor, near Toowoomba, Jan 1976, *Gilbert* (BRI). New South Wales. NORTH COAST: Wilson Park, Lismore, Jan 1977, *Floyd* 195 (NSW); Byron Bay, Nov 1903, *Maiden & Boorman* (NSW).

Specimens from 57 Australian localities were examined.

Distribution and Habitat: Found from Northern New South Wales to the tip of Cape York, Queensland, (Map 4.) and into New Guinea as well as isolated localities in the Northern Territory. It is found chiefly in rainforest and to a lesser extent in semi-deciduous vine thickets and riverine gullies. This species appears to be deciduous under marginal conditions.

Flowering period: October–May.

Fruiting period: March.

Notes and Observations: This species occurs in New Guinea where it was described as *Cissus grandifolia* by Warburg (1894). Careful examination of Hellwig 125 (K) marked 'det. by Warburg' and Branderhorst 142 (K) cited by Lauterbach (1925) failed to separate this material from specimens of *C. acris*. Unfortunately the material is scrappy and as the majority of specimens of *C. acris* are vegetative, confusion has existed between this species and *C. cardiophylla* which has till now been misidentified as *C. grandifolia*. Merrill and Perry (1941) noted 'that the pubescence on the lower surface of the leaves is confined to the midrib and the larger nerves', whereas Warburg (1894) described the lower surface as pubescent.

6. *Cayratia eurynema* B.L.Burt, Bull. Misc. Inform.: 179 (1939). Type: Comboyne, N.S.W., May 1935, *E.C. Chisholm* (holo: K; iso: BRI, L,MO,NSW); para: Dorrigo, Jan 1936, *L. Frazer* (K).

Scrambling vine, stems angular, pubescent, hairs often reddish. Tendrils 3–5-fid, pubescent when young. Tuber absent, but extensive underground system present. Leaves pedate, 5 leaflets, soft. Central leaflet obovate-elliptical, apex acuminate-apiculate, oblique at base, (4.8–)8.6(–14) cm × (3–)4.2(–8) cm; lateral leaflets broad, oblique, upper lateral (5.2–)9.3(–13.5) cm × (3–)4.4(–7.2) cm; lower lateral (4–)6(–10) cm × (1.9–)3.1(–6) cm. Margins with numerous serrations on both sides of the midrib. Upper surface sparsely pubescent, hairs uniseriate 3–16-celled reddish, chiefly associated with the veins; hairs on lower surface similar but denser. Central petiolule channelled, (1.2–)2.2(–4.3) cm long; lateral petiolule (0.3–)0.8(–1.8) cm long. Petiole (4.2–)7.3(–12.5) cm long, ridged. Stipules triangular, 1.5–2 mm × 1 mm. Inflorescence axillary paniculate corymbiform, 2–3 primary branches, 12.5–15 cm long, peduncle 4–8.5 cm long, pubescent. Calyx pubescent. Corolla papillose, 2–3.5 mm × 1–2 mm. Filaments 0.75 mm long, 0.5 mm broad, anthers 0.75 mm long, thecae diverge slightly at the base. Berry black, slightly compressed 8 mm × 6–8 mm. Seeds 1 rarely 2 per fruit, boat-shaped, 5 mm × 5 mm, 2 very shallow grooves present on ventral surface, endosperm in transverse section shallowly T-shaped. Fig. 4A–D.

Representative Specimens Examined. Queensland. MORETON DISTRICT: Blackall Range, Apr 1918, *White* (BRI); Mount Glorious, Moreton District, Jan 1945, *Clemens* (BRI,GH,K); New South Wales. NORTH COAST: Dorrigo Brush, Apr 1953, *Vickery* (NSW); Upper Williams River ca 7 miles [11.2 km] NNW of Salisbury, Aug 1960, *Johnson* (NSW). NORTHERN TABLELANDS: Gibraltar Range, 80 km NE of Glen Innes, Jun 1963, *Williams* (NE).

Specimens from 19 localities were examined.

Distribution and Habitat: This species is usually found on rainforest margins in an area extending from Barrington Tops N.S.W. (32°10'S, 151°30'E) to North of Brisbane (Map 5). It has also been collected in the Blackall Ranges.

Flowering period: January to April.

Fruiting period: May.

Notes and Observations: This species is easily distinguished by the oblique base of the central leaflet, the reddish hairs on the soft leaves, the broad, thick staminal filament and the anther thecae which diverge slightly at the base.

7. *Cayratia japonica* (Thunb.) Gagnep. Notul. Syst. (Paris) 1: 349 (1911).

Vitis japonica Thunb., Fl. Japan 104 (1784); F.M.Bailey, Qd Fl. 1: 281 (1899). Type: not seen.

Cissus japonica Willd., Sp. Pl. 1: 659 (1797); DC., Prodr. 1: 632 (1824); Planchon in A. & C.DC., Monogr. Phan. 5: 561 (1887).

Columella japonica (Thunb.) Merrill, Philipp. J. Sci. 13: 145 (1918).

Vitis mollis Wall. Cat. No. 6025 (K).

Cissus obovata Lawson in J.D.Hook., Fl. Brit. India 1: 658 (1875).

Scrambling vine, stems ridged, often reddish when young, hairs chiefly at nodes. Tendrils 2–3-fid, ridged, usually glabrous. Tuber small or absent, plant rarely deciduous, extensive underground root system, which suckers readily. Leaves pedate with 5 leaflets. Central leaflet broadly-lanceolate to ovate, apex acuminate-cuspidate, base rounded, (5.2–)8.1(–11) cm × (2.6–)3.7(–5.7) cm; lateral leaflets oblique; upper laterals (2.9–)6.8(–11) cm × (1.9–)3.2(–4.8) cm; lower laterals (2.7–)4.8(–8) cm × (1.5–)2.7(–4.2) cm. Margins serrated sometimes sharply on both sides of the midrib. Upper surface pubescent, hairs uniseriate 5–7-celled, chiefly confined to the veins at maturity. Lower surface pubescent, hairs uniseriate 7–14-celled, longer ones usually associated with the veins. Sometimes densely pubescent often with a rusty tinge. Central petiolule ridged, (1.1–)2.1(–3.5) cm long; lateral petiolules ridged, (0.3–)0.9(–1.8) cm long. Petiole ridged, (2.6–)5.6(–9.2) cm long. Stipules triangular, 2–3(–5) mm × 1–1.5 mm. Inflorescence axillary, 3 primary branches, cymose corymbiform, (5–)8(–14) cm × (1–)3(–5) cm, peduncle (3–)6(–11) cm long. Calyx papillose, shortly lobed. Corolla papillose, 1.5–2 mm long, thickened on the back near the apex, greenish-white to yellowish. Filaments 0.5–0.75 mm long, anthers 0.5 mm long. Disc thick. Berry purplish-blue to black, depressed-globular 7–10 mm × 4–6 mm. Seeds 2–4 per fruit, trigonal, 3.5–5 mm × 3–4 mm; 2 shallow grooves on the ventral side, endosperm in transverse section T-shaped. Figs. 4E–H.

Representative Specimens Examined. Queensland. COOK DISTRICT: Iron Range, Jun 1948, *Brass* 19067 (A,CANB,K,L); Gap Creek, 38 km S by E of Cooktown, Sep 1960, *Smith* 11222 (BRI,L); Yarrabah, Jan 1910, *Domin* 6408 (PR). NORTH KENNEDY DISTRICT: 1 mile [1.6 km] E of Ravenshoe, Jun 1975, *Stacker* 1230 (QRS); Bluewater Forestry Reserve, N of Townsville, Sep 1978, *Jacks* (A,DNA,JCT,K,L,MEL). SOUTH KENNEDY DISTRICT: Dalrymple Heights, W of Mackay, Aug 1977, *Jacks* (BRI,JCT). BURNETT DISTRICT: Cania Gorge ca 37 km NW of Monto, Nov 1976, *Stanley* (BRI). WIDE BAY DISTRICT: Kin Kin, Sep 1919, *Francis* (BRI). MORETON DISTRICT: Mount Glorious in rainforest, May 1951, *Blake* 18756 (BRI).

Specimens from 58 Australian localities were examined.

Distribution and Habitat: This species is widespread in the Asian countries extending from Annam, north to Korea and east to New Caledonia. In Australia it is found along the east coast of Queensland (Map 6.) from just north of Brisbane to the tip of Cape York usually as a trailing or climbing vine 3–4 m high along rainforest margins. Soils various.

Flowering period: all months of the year.

Fruiting period: all months of the year.

Notes and Observations: This is a variable species, with some plants densely pubescent, whilst others are almost glabrous. Multibranched tendrils are sometimes found, and these have also been recorded for *C. eurynema* and *C. clematidea*.



Maps 1-3. 1. *Cayratia maritima*. 2. *C. trifolia*. 3. *C. cardiophylla*.

8. *Cayratia clematidea* (F.Muell.) Domin in Fedde, Repert. 11: 264 (1912).

Vitis clematidea F.Muell., Fragm. 2: 74 (1860). **Lectotype** (designated here): Clarence River, *Beckler* (MEL 540138; isolecto: K); **lectopara**: Brisbane R., *Mueller* (MEL,K,P); F.Muell., Fragm 5: 210 (1866); F.Muell., Fragm. 6: 177 (1868); F.Muell., Fragm. 9: 126 (1875); Benth., Fl. Austral. 1: 449 (1863); F.M.Bailey, Qd Fl. 1: 282 (1899).

Cissus clematidea (F.Muell.) Planchon in A. & C.DC., Monogr. Phan. 5: 566 (1887).

Weakly scrambling, sometimes climbing vine, stems ridged, pubescent when young, hairs pale uniseriate 5–12-celled. Tendrils 2–3-fid, ridged, rarely pubescent. Tuber present, plant often deciduous. Leaves pedate with 5 leaflets, soft. Central leaflet broadly lanceolate-ovate, apex acuminate, base cuneate sometimes rounded, (2–)4.3(–8) cm × (1–)2.2(–4.2)cm; lateral leaflets oblique, upper laterals (1.8–)3.3(–6) cm × (1–)1.9(–3.4) cm; lower laterals (1.1–)2.5(–5.6) cm × (0.6–)1.6(–3) cm. Margins serrated on both sides of the midrib sometimes coarsely. Upper and lower surfaces with uniseriate 5–12-celled hairs, chiefly associated with the veins at maturity. Central petiolule ridged, (0.6–)1.5(–3) cm long; lateral petiolule ridged, (0.3–)0.5(–1) cm long. Petiole (1.5–)3.4(–9) cm long. Stipules narrow triangular, 3.5–5 mm × 1–1.5 mm. Inflorescence leaf-opposed or pseudoaxillary, usually 3 primary branches, cymose, corymbiform, (3–)6(–11) cm × (2–)5(–7) cm, peduncle (2–)4(–9) cm long, pubescent. Calyx short. Corolla papillose, 1.5–2 mm long, green to yellowish-green. Filaments 0.75 mm long, anthers 0.75 mm long. Disc entire, pink when fresh. Berry black, depressed globular, 6–7 mm × 4 mm. Seeds 1–4 per fruit, 3.5–4 mm × 3.5–4 mm, 2 very shallow grooves on the ventral side, endosperm in transverse section T-shaped. **Fig. 4I–L.**

Representative Specimens Examined. Queensland. NORTH KENNEDY DISTRICT: Paynes Lagoon, 100 km W of Townsville, Jun 1981, *Jackes* (BRI,JCT,QRS). SOUTH KENNEDY DISTRICT: Dalrymple Heights, Sep–Nov 1947, *Clemens* (K). LEICHHARDT DISTRICT: Blackdown Tableland, ca 35 km SE Blackwater, Sep 1971, *Henderson, Durrington & Sharpe* (BRI). MORETON DISTRICT: Montville, May 1943, *Blake* 14956 (BRI); Brisbane River, Mar 1933, *White* 8648 (A,BRI,K). New South Wales. NORTH COAST: Tweed District, Mar 1896, *Betche* (NSW); Seal Rocks, 20 miles [32 km] E of Buladelah, Aug 1965, *Briggs* (NSW); Williams River about 40 miles [64 km] N of Singleton, Jan 1963, *Pullen* 3753 (CANB). CENTRAL COAST: Prospect, May 1905, *Cabbage* (NSW); Shoalhaven River, Jan 1932, *Rodway* 685 (K,NSW). NORTHERN TABLELANDS: Mole River crossing, north of Silent Grove (SW of Tenterfield), Nov 1965, *Williams* (JCT,NE). NORTH WEST SLOPES: Cranky Rock, Warialda, Aug 1906, *Rupp* (NSW).

Specimens from 98 localities examined.

Distribution and Habitat: Usually found in moist shaded area, often on the edge of rainforest, climbing over rocks and shrubs. It extends from southern New South Wales to west of Townsville in north Queensland (**Map 7.**). Soils various.

Flowering period: Most of the year though predominately in summer.

Fruiting period: Most of the year though predominately in autumn.

Notes and Observations: This species is readily distinguished from *C. japonica* by the usually smaller leaves the margins of which are often sharply serrated, and the leaflet bases usually cuneate, the long narrow stipules, and the petals which are rarely thickened at the apex.

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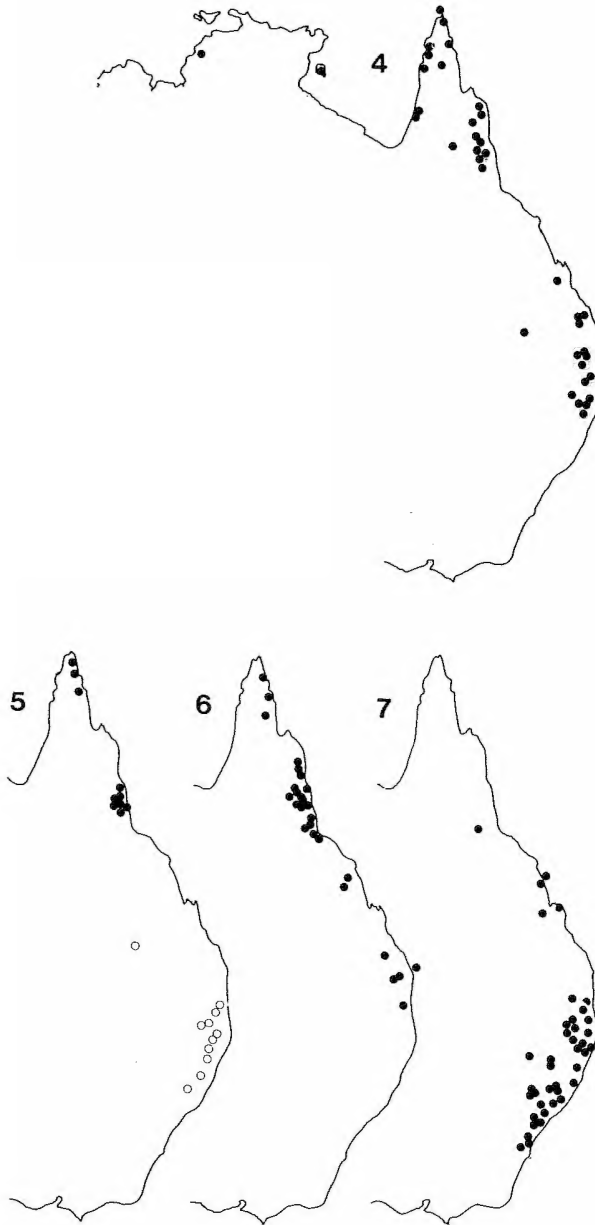
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Maps 4-7. 4. *Cayratia acris*. 5. ● *C. saponaria*, ○ *C. eurynema*. 6. *C. japonica*. 7. *C. clematidea*.